SSVEO IFA List **Date:02/27/2003**

STS - 26R, OV - 0, Discovery (0) **Time:04:22:PM**

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Prelaunch	Problem	**FIAR**	**IFA** STS-26R-V-01	OMS
GNC-01	**GMT:** Prelaunch		**SPR** 26RF16	**UA**	**Manager:**
			IPR None	**PR**	
					Engineer:

Title: Left OMS Standby Gimbal Actuators Failed. (ORB)

Summary: DISCUSSION: During the prelaunch OMS Gimbal Profile Test at approximately T-5:45, the left OMS secondary (standby) pitch and yaw actuators did not drive with only the "enable 1" (RPC 1) command on. During prelaunch troubleshooting, both (pitch and yaw) actuators drove properly with the "enable 2" (RPC 2) command on. An MDM BITE test was successfully performed which indicated that the most likely failure was in the Power Control Assembly (PCA) or an open wire or connector preventing 28 VDC motor drive power from RPC 2 from reaching the motor drivers. RPC 1 and RPC 2 provide parallel power to the motor drivers.

The Left OMS Standby Actuators were considered unusable for flight because both pitch and yaw actuators are required to be driven simultaneously, and the current draw would exceed the 13.75 amp trip-limit for a single RPC. Launch Commit Criteria (page 6.9.10-39) was invoked, which allows countdown to continue with a failure of either the primary or secondary actuator channel for one OMS engine. The failure was confirmed in flight during a post-insertion gimbal drive test during which RPC 2 tripped off after some movement of the actuators. During the remainder of the mission the left OMS gimbal functioned normally under control of the primary actuators. Post flight troubleshooting identified an open circuit between Aft PCA #2 and the left OMS Controller (Connector P9967, Pin NN). CONCLUSION: The OMS gimbal drive failure was caused by an open circuit which prevented 28 VDC power from reaching the motor drivers via RPC 1. CORRECTIVE_ACTION: Launch Commit Criteria was clarified to permit loss of either primary or secondary controller on a given OMS engine. The open circuit has been repaired. EFFECTS_ON_SUBSEQUENT_MISSIONS: None, pending the results of failure analysis.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Prelaunch	Problem	**FIAR**	**IFA** STS-26R-V-02	C&T
INCO-01	**GMT:** Prelaunch		**SPR** 26RF17	**UA**	**Manager:**
			IPR None	**PR**	

Engineer:

Title: Network Signal Processor (NSP) 1 Frame Synchronization Not Locked On Transponder 2. (ORB)

Summary: DISCUSSION: During prelaunch checkout, NSP 1 did not indicate bit or frame synchronization when configuration was switched by uplink command from S-band transponder 1 to transponder 2. Prelaunch troubleshooting switched back to transponder 1 and frame synchronization lock was good. All subsequent combinations of transponders and NSP's resulted in valid frame synchronization lock. Launch mode is NSP 2 selected and configured to transponder 2 (string 2). Launch Commit Criteria redundancy requirements were verified by placing the S-BAND PM CNTL switch from CMD to PANEL which selected NSP 1 configured to transponder 1 (string 1), and verifying NSP 1 frame synchronization lock. Postflight troubleshooting failed to reproduce the anomaly. Any additional troubleshooting would require shipment of the transponder to the vendor for failure analysis. Pending recurrence of this anomaly on subsequent missions, failure analysis is not considered warranted based on system redundancy and the low probability that a specific cause could be identified.

CONCLUSION: The most probable cause of this anomaly is an intermittent malfunction of the forward link data relay in transponder 2 after which subsequent cycling cleared the problem. CORRECTIVE_ACTION: None, pending recurrence on subsequent missions. EFFECTS_ON_SUBSEQUENT_MISSIONS: None

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Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Prelaunch	Problem	**FIAR** WC0380	**IFA** STS-26R-V-03	GFE
MMACS-01	**GMT:** Prelaunch		**SPR**	**UA**	**Manager:**
			IPR None	**PR**	

Engineer:

Title: The Mission Specialist 1 and Pilot's Suit Vent Fans Failed. (GFE)
<u>Summary:</U> DISCUSSION: During prelaunch preparation the Mission Specialist 1 and the Pilot's Personal Suit Ventilation System fans failed to operate. Subsequent investigation revealed that the 3 amp fuses (part number ME451-0009-0003) feeding power to the fan motors had blown. At the time of suit fan motor activation, the fuel cell voltage feeding the related power bus was reading between 30.5 and 31.0 volts. It was concluded that the 3 amp fuse, specified in the fan motor design, was marginal and would not survive the in-rush current of a 31.0 volt buss. The 3 amp fuses were replaced with part number ME451-0009-0005 fuses which were thought to be 5 amp fuses. The fan motors then operated nominally through the ascent phase of the mission. Later it was discovered that the -0005 fuses were in fact 10 amp fuses and would not protect the 24 gage power wiring inside the fan motor assembly. Since the fan motor assembly is a completely sealed unit there was no hazard to the crew had a short circuit developed in the fan motor power circuit. During ground tests, using a spare suit fan motor, it was determined that a 5 amp fuse was adequate for wire protection and fan motor operation.

Prior to entry, all suit fan motor power fuses (five) were replaced with verified 5 amp fuses that were part of the inflight maintenance kit carried onboard the spacecraft. There was no further impact on the mission. During certification of the suit fan motor assembly, the motor power circuit was not protected by a fuse. The units were later modified to include a 3 amp fuse, however testing at voltages greater than 28 volts was not accomplished. CONCLUSION: The 3 amp fuse in the original suit fan motor power circuit design were underrated for the voltage levels that could be expected in the spacecraft while operating on fuel cells. CORRECTIVE_ACTION: The suit fan motor power circuit design has been changed to reflect replacement of the 3 amp fuses with 5 amp fuses (part number ME451-0009-1021) on all units. Reference CCB directive G2086. A spare suit fan, cables and fuses will be available for countdown operations. EFFECTS_ON_SUBSEQUENT_MISSIONS: None

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Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-26R-V-04	OI - Sensors
MMACS-02, BSTR-02	**GMT:**		**SPR** A) 26RF07, B) 26RF20, C) 26RF08, D) 26RF18, E) 26R	**UA**	**Manager:**
				PR	
					Engineer:
			IPR None		

Title: Operational Instrumentation Failures. (ORB)

Summary: DISCUSSION: A. At liftoff, the Auxiliary Power Unit (APU) Number 3 Exhaust Gas Temperature Number 2 measurement (V46T0340A) became erratic, cycling between 38 degrees F and 957 degrees F and failing at 44 degrees F. Postflight troubleshooting confirmed transducer failure. The transducer has been removed and replaced. Failure analysis will be tracked by CAR 26RF07. This is a criticality 3 measurement.

B. The right Space Shuttle Main Engine (SSME) liquid hydrogen (LH2) inlet pressure measurement (V41P1300C) was erratic prior to SSME shutdown. At main engine cutoff (MECO), the measurement went to zero. Postflight troubleshooting confirmed transducer failure. The transducer has been removed and replaced. Failure analysis will be tracked by CAR 26RF20. This is a criticality 3 measurement. C. Approximately 5 minutes after touchdown, the APU Number 1 Exhaust Gas Temperature Number 1 (V46T0142A) became erratic, cycling between 38 degrees F and 950 degrees F. Postflight troubleshooting confirmed transducer failure. The transducer has been removed and replaced. Failure analysis will be tracked on CAR 26RF08. This is a criticality 3 measurement. D. At 3:01:22 mission elapsed time, the hydraulic system number 1 "B" supply pressure (V58P0115A) was biased low by approximately 60 psia. The low bias is within specification limits. No corrective action is required. This is a criticality 1R3 measurement. E. At T-1 hour prelaunch, the hydraulic system number 3 circulation pump pressure measurement (V58P0337A) was biased low by 80 psia at operating pressure. This bias is considered acceptable. No corrective action is required. This is a criticality 3R3 measurement. F. Throughout the flight, the number 2 SSME LH2 inlet pressure measurement (V41P1200C) oscillated with a low bias of 3-5 psia. The bias and slight oscillation is considered acceptable. No corrective action is required. This is a criticality 1R3 measurement. G. At T+3 minutes, the Freon evaporator out temperature (V63T1407A) on Freon coolant loop number 2 lagged behind Freon coolant loop number 1 Freon evaporator out temperature (V63T1207A) by about 10 degrees F and about 5 seconds. Postflight troubleshooting confirmed a debonded sensor. The sensor has been removed and replaced. Failure analysis will be tracked by CAR 26RF10. This is a criticality 2R3 measurement. H. At T+70 seconds through T+127 seconds mission elapsed time, the external tank 98 percent liquid level point sensor measurement (T41X1716E) operated erratically

(flashing). Troubleshooting has been completed, no anomaly detected in orbiter system, and the problem is under evaluation. There was no impact to the flight. This is a criticality 3/3 measurement. CONCLUSION: See above. CORRECTIVE_ACTION: See above. EFFECTS_ON_SUBSEQUENT_MISSIONS: Effects on Subsequent Missions: None

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Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:00:04	Problem	**FIAR**	**IFA** STS-26R-V-05	Active Thermal Control
EECOM-02	**GMT:** 273:15:41		**SPR** 26RF11	**UA**	Subsytem
			IPR None	**PR**	**Manager:**
					Engineer:

Title: The Flash Evaporator System Hi-Load Evaporator Froze During Ascent and Shut Down During Entry. (ORB)

Summary: DISCUSSION: During ascent, prior to Flash Evaporator System (FES) activation, the EVAP OUT temperature dropped to 43 degrees F, indicating water/condensate in the FES cores. After FES activation, the Hi-Load duct temperature decreased below normal temperatures, causing the crew to switch to dual heater string activation. At 42 minutes mission elapsed time, the EVAP OUT temperature rose to 43 degrees F, and held for 40 seconds, causing a Controller A, Hi-Load overtemp shutdown. Successive attempts by the crew to switch to Controller B, back to Controller A, and again to Controller A, also met with immediate overtemp shutdown of the FES. The crew then switched to the Secondary Controller on the Topping Evaporator which controlled the EVAP OUT temperature at 62 degrees F, until the payload bay doors were opened and radiator cooling has been activated. A large amount of ice was flushed from the Topping Evaporator as indicated by the decrease in duct temperature when the Secondary Controller was activated.

Procedures were developed and successfully implemented for switching to Controllers A and B and using the FES for dumping supply water during on-orbit operations. These procedures were also used to verify the controllers and the Hi-Load and Topping Evaporators were functional prior to de-orbit ignition. During the de-orbit burn, however, FES Controller B experienced another overtemp shutdown. The crew then switched to the Secondary Controller on the Hi-Load Evaporator which performed normally. Subsequent boroscope inspection through the FES core drain ports and valve ports revealed extensive evidence of corrosion/contamination in the Topping Evaporator along the longitudinal core and along several inches of the weld between the core barrel and sections. Water was found in the Topping Evaporator core and approximately one and one-half liters remained through landing that had formed as ice. The four water vales/nozzle assemblies (two from each evaporator) were removed and revealed no evidence of external damage or corrosion. Minimal corrosion/contamination was visible using the boroscope in the Hi-Load core. Ground checkout of the FES controllers has shown that the controllers are functioning nominally. The accumulators were verified by x-ray. CONCLUSION: The FES problem was most likely caused by contamination/corrosion in the Topping Evaporator. CORRECTIVE_ACTION: The OV-103 FES will be removed and replaced. The OV-104 FES has been boroscoped. Results showed no moisture and minimum but acceptable contamination visible. For future missions, removal of the FES duct plugs will be delayed until the end of the T-11 hour hold to minimize FES exposure to water condensation from the atmosphere. Boroscope inspection of the FES cores will also be required prior to each

flight. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-26R-V-06	C&T - Ku-band
INCO-04	**GMT:** 274:12:16		**SPR** 26F01	**UA**	**Manager:**
			IPR None	**PR**	
					Engineer:

Title: The Ku-Band Antenna Failed To Follow The Designated Angles. (ORB)

Summary: DISCUSSION: The Ku-Band system failed self-test at 274:12:16:15 G.m.t. It was assumed that the failure was a known condition related to the active mode of the radar, which has been previously experienced was not an indication of a system failure. The crew was instructed to proceed with Ku-Band operations. The system operated successfully until 274:15:24:00 G.m.t. at which time the antenna did not follow the designated angles. Since the Ku-Band was not mandatory for this mission, it was decided to manually slew the antenna to the lock angles and lock the gimbals. When the antenna was slewed to near the lock angles, an oscillation was observed and the system was put in standby until a procedure was developed to enhance the stow activity. The antenna was then successfully slewed to the lock angles, the gimbals were locked, and the Deployed Assembly (DA) was stowed at 274:22:02:44 G.m.t. The review of the flight data indicated that the antenna was being prevented from rotating, causing both the self test failure and the inability to track TDRS. It was suspected that one or both of the gimbal lock arms did not fully retract, thus impeding the motion of the antenna. The on-orbit anomaly could not be duplicated during postflight troubleshooting at KSC; however, during two attempts to unlock the gimbals the lock arms did not retract. Further investigation revealed that the lock motor drive signal from the Electronics Assembly 1 (EA-1) was incorrect. Also during a visual inspection of the DA, scratches were found on the Rate Sensor Assembly (RSA) bracket (located on the innermost gimbal) and the protective case around the sequencing switch (located on the top lock arm) was bent, indicating that contact had been made. Both the DA and the EA-1 were removed and returned to the vendor for failure analysis.

CONCLUSION: The most probable cause of the anomaly was that the top lock arm failed to fully retract. This allowed contact between the RSA bracket and the sequencing switch protective case, thus preventing the antenna from rotating. CORRECTIVE_ACTION: Both the DA S/N 105 and EA-1 S/N 105 were removed and returned to the vendor for failure analysis. The OV-104 guide lock pin operation has been verified. EFFECTS_ON_SUBSEQUENT_MISSIONS: None pending the results of the failure analysis.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Prelaunch	Problem	**FIAR**	**IFA** STS-26R-V-07	MPS
BSTR-03	**GMT:** Prelaunch		**SPR** 26RF03	**UA**	**Manager:**
			IPR None	**PR**	

Engineer:

Title: GOX Flow Control Valves On SSME 1 and 2 Operated Sluggishly. (ORB)

Summary: DISCUSSION: During its first open cycle, approximately 1 second prior to SRB ignition, the SSME 1 Gaseous Oxygen (GOX) Flow Control Valve (FCV) took approximately 1 second to open. Normal opening time should be 0.2 seconds. The first open cycle on the SSME 2 GOX FCV started normally but tailed off near the end, taking approximately 0.47 second (vice 0.2) to complete. The third open cycle of FCV 1 took approximately 0.6 seconds. All other cycles appeared nominal.

Postflight inspection revealed significant particulate contamination and gouging marks in FCV 1, and lesser contamination and gouging in FCV 2. FCV 3, which did not exhibit binding during flight, showed a small amount of contamination and marks. The presence of contaminants has the greatest effect on the first cycles of the FCV's because of the thermal gradient the valves are encountering when receiving their first flow of hot gas after being coldsoaked prelaunch. This thermal gradient produces material deformations which sufficiently reduce the internal clearance between the poppet and sleeve so as to allow contaminants to cause binding. Continued hot gas flow causes the valves to thermally stabilize and the clearances to increase, thus eliminating the contaminant interference to movement. As a result of sluggish behavior of position 1 and 3 valves during the STS-26 FRF, which was found to be due to contamination, valves from similar positions in OV-104 were removed from OV-104, cleaned and installed on OV-103 for STS-26 use. The position 2 valve, which exhibited normal opening times during the FRF, was removed from OV-103 post FRF, recycled to the vendor and reinstalled for STS-26. CONCLUSION: The combination of contamination in GOX FCV's 1 and 2 along with deflection of the valves due to thermal gradients present during the initial cycles probably caused partial binding between the poppet and sleeve. This binding was eliminated as the valves were thermally stabilized due to continued hot gas flow. CORRECTIVE_ACTION: Three valves were removed from OV-103, cleaned, and their clearances increased to 0.0010-0.0012 inches from 0.0008-0.0009 inches. The valves will be reinstalled in OV-103 and used in the next flight. The clearances on OV-102 and OV-104 valves will similarly be increased. EFFECTS_ON_SUBSEQUENT_MISSIONS: Effects on Subsequent Missions: None

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Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 001:19:25	Problem	**FIAR**	**IFA** STS-26R-V-08	GNC
GNC-02	**GMT:** 275:11:02		**SPR** 26RF02	**UA**	**Manager:**
			IPR None	**PR**	
					Engineer:

Title: COAS Adapter Plate Could Not Be Mounted Properly (ORB)

Summary: DISCUSSION: At 275:11:02 G.m.t., the crew attempted a calibration of the COAS from the +X (commander's window) position. A 1.97 degree differential bias was noted from this calibration. The crew later reported the nut plate on panel O1, into which the COAS knurled mounting screw threads, was missing. They had secured the COAS to the +X mounting station with its three guide pins and gray tape. The COAS could be mounted to the -Z (overhead window) nominally, therefore, -Z calibration data was utilized for the remainder of the flight.

Postflight inspection has shown that the nut plate is not missing, however the COAS knurled screw could only engage approximately 1-1/4 threads in the nut plate. Nominally the screw should engage 4 to 5 threads. CONCLUSION: The COAS mounting problem was due to the knurled mounting screw not extending far enough into the nut plate to securely engage the nut plate threads. CORRECTIVE_ACTION: The COAS is being returned to JSC for further analysis. The OV-104 COAS installation has been fit-checked. EFFECTS_ON_SUBSEQUENT_MISSIONS: None, pending results of failure analysis.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:00:13	Problem	**FIAR**	**IFA** STS-26R-V-09	HYD
MMACS-5	**GMT:** 273:15:50		**SPR** None	**UA**	**Manager:**
			IPR None	**PR**	
					Engineer:

Title: Water Spray Boiler 1 GN2 Pressure Regulator Relief Valve Leak. (ORB)

Summary: DISCUSSION: Water spray boiler 1 gaseous nitrogen (GN2) pressure regulator relief valve leakage was observed after nitrogen (N2) isolation valve closure following auxiliary power unit shutdown at 273:15:50:34 G.m.t. The regulator pressure exhibited a steady decay of 3 psia in the next 15 hours, at which time the decay stopped. This occurrence had no impact on the mission. This condition has been seen on previous missions (STS-8, STS 51-J, STS-51-A) and was attributed to the GN2 relief valve not properly seating after ascent. The nitrogen pressure tank is isolated by a valve when the water spray boiler is not functioning. This assures retention of the nitrogen source pressure should manifold leaks such as these occur.

CONCLUSION: The water spray boiler 1 gaseous nitrogen regulator pressure most probably decayed because of the relief valve not properly seating after ascent. CORRECTIVE_ACTION: The water spray boiler 1 relief valve will be leak-tested during turnaround operations. Relief valve out-of-specification leakage will result in the removal and replacement of the valve. EFFECTS_ON_SUBSEQUENT_MISSIONS: None

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Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 003:03:14	Problem	**FIAR**	**IFA** STS-26R-V-10	Water and Waste
EECOM-06	**GMT:** 276:18:51		**SPR** 26RF06	**UA**	Management System
			IPR None	**PR**	**Manager:**
					Engineer:

Title: Waste Collection System Fan Separator 1 Showed Indications Of Flooding. (ORB)

Summary: DISCUSSION: At 276:18:51 G.m.t., stall currents were observed while the crew attempted to use Waste Collection System (WCS) fan separator 1. The crew reported low airflow and switched to WCS fan separator 2, which performed nominally for the remainder of the mission.

Postflight boroscope inspection of fan separator 1 revealed urine salts in the system which is evidence of flooding. Stall currents were repeated during ground testing. The WCS, including fan separator 1, was removed and sent to the vendor for further analysis. The vendor has found approximately 130 cc of liquid still in the fan separator unit, evidence of liquid in the motor and stator, and urine salts around the fan bearings, indicating that the fan separator did experience flooding. CONCLUSION: WCS fan separator 1 experienced flooding, which caused its motor to stall. CORRECTIVE_ACTION: The WCS and fan separator have been removed and sent to the vendor for analysis. Fan separator redesign is in work. A demonstration unit may be flown as early as STS-28 with the new design. The OV-104 fan separator has been flow-checked. EFFECTS_ON_SUBSEQUENT_MISSIONS: None, pending results of failure analysis.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 003:21:18	Problem	**FIAR**	**IFA** STS-26R-V-11	MECH
MMACS-08	**GMT:** 277:12:55		**SPR** 26RF05	**UA**	**Manager:**
			IPR None	**PR**	
					Engineer:

Title: Starboard Payload Bay Door Forward Ready-to-Latch Indicator "A" Talkback Did Not Function. (ORB)

Summary: DISCUSSION: During payload bay door closing at 277:12:55 G.m.t., the starboard payload bay door forward ready-to-latch indicator did not give its "ready" indication.

There are four instrumentation modules on the payload bay door; one each located in the forward port, forward starboard, aft port and aft starboard positions. Each module has four indicators, three for the ready-to-latch and one for the door closed indications. The three ready-to-latch indicators are used by the automated software. One of these can be lost and the software will still vote properly. However, even if all were lost the payload by doors could still be closed using the manual mode, i.e., the crew would make an item entry from the CRT. Troubleshooting detected a failure in the indicator's limit switch. The module is being reworked; the switch subassembly is being replaced and the module returned for reinstallation on the vehicle. The failed switch in the removed subassembly is being replaced with one that has been Particle Impact Noise Detection (PIND) tested. A requirement has been added to PIND test all recycled switches and put epoxy on the set screw after adjustment. CONCLUSION: The latch indicator talkback did not function due to an inoperative limit switch. CORRECTIVE_ACTION: Remove and replace the switch assembly and reinstall the module. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Prelaunch	Problem	**FIAR**	**IFA** STS-26R-V-12	APU
MMACS-04	**GMT:** Prelaunch		**SPR** 26RF04	**UA**	**Manager:**
			IPR None	**PR**	
					Engineer:

Title: APU 3 Exhibited Low Chamber Pressure/High Fuel Usage. (ORB)

Summary: DISCUSSION: The prelaunch activation of Auxiliary Power Unit (APU) 3 at 273:15:32:12.075 G.m.t. revealed the presence of a bubble in the fuel line and the accompanying low gas generator chamber pressure (Pc). Pc stabilized to a value of 930 psia which was above the Launch Commit Criteria minimum limit with bubble present of 825 psia. Although the bubble soon appeared to dissipate as expected, Pc did not significantly recover to a higher value. When APU 3 was started prior to deorbit at 277:15:53:41.901 G.m.t., Pc was 100 psia lower than APU 2 even though no bubble was present. After Orbiter touchdown, a bubble unexpectedly reappeared.

During the post-landing hydraulic load test, which puts a high load on each APU, the APU 3 Pc recovered to normal values. Throughout the mission APU 3 met all power demands placed upon it. The low Pc was within specifications and had no impact on the mission. This was the first flight of new "low bubble point" filters in the APU fuel lines. The new filters were expected to reduce bubble formation. It is possible that the APU 3 filter had an entrapped (rather than a dissipated) bubble during ascent and this bubble reappeared after touchdown. The APU 3 high fuel usage rate was observed during the Acceptance Test Procedures. Since it was within specification levels, it was deemed acceptable for flight. During the STS-26 mission, APU 3 displayed a 15 percent higher fuel consumption rate when compared to APU 2, which had approximately the same total run time. APU 3 used 25 pounds more fuel during the mission. This fuel consumption rate was within specifications and had no impact on the mission. CONCLUSION: The presence of bubbles and corresponding low chamber pressures are typical occurrences during flight and are not a concern as long as the chamber pressure recovers under load. APU 3 Pc recovered to expected values when under load, indicating it would be capable of meeting any designed load required. The fact that the Pc did not recover after the bubble seemingly disappeared may be a signature of the new "low bubble point" filter. The high fuel consumption rate of APU3 is a characteristic of that unit. The rate is within specifications and is acceptable for flight. CORRECTIVE_ACTION: Analysis of the performance of APU 3 during the STS-26 mission has shown that it will continue to perform within specifications for the next flight of OV-103. It will not be removed from the vehicle. Both the OMRSD and the Launch Commit Criteria are being revised to reflect the minimum acceptable chamber pressure. EFFECTS_ON_SUBSEQUENT_MISSIONS: APU 3 is expected to display similar chamber pressure and fuel consumption characteristics during subsequent missions. However, the load carrying capability of the APU will continue to be nominal.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR**	**IFA** STS-26R-V-13	TPS
None	**GMT:** Postlanding		**SPR** 26RF13	**UA**	**Manager:**

IPR **PR**

Engineer:

Title: Right Wing TPS Damage. (ORB)

Summary: DISCUSSION: Damage to the right wing lower surface TPS was noted post-flight. The area measured approximately 6" x 18" x 1 1/2".

An analysis of the ascent photography showed an impact to the lower right wing at approximately 52 seconds mission elapsed time. During post flight inspection of the right hand SRB, several pieces of the protective cork covering the SRM Development Flight Instrumentation (DFI) cable (also called cap cork) were discovered missing. The results of a Debris Trajectory Analysis, which included a launch Vehicle Debris Analysis and Transport Method Analysis, indicated that the DFI cable cork can impact the Orbiter when a lift transport mechanism is present. Based on data from five lower surface tile thermocouples, the overall vehicle boundary layer transition from laminar to turbulent flow occurred later than expected and was largely attributed to the smoothing (shaving) of the nose area tiles. The "backed out" nose area analytical equivalent roughness were 0.127 inches as compared to the requirement of 0.140 inches and the maximum measured value of 0.135 inches. The late overall transition minimized the effect of early transition at the impact damage site. Increased turbulent heating effects downstream of the impact site created local melting of the tile material where coating had been removed as a result of particle impacts emanating from the large impact site. No evidence of structural damage was found at the impact site based on visual inspection and temperature indicator readings inside the wing. Non-destructive testing (NDT) of the area has not been completed at this time. CONCLUSION: The right wing TPS damage was probably caused by SRB thermal protection debris which came loose during ascent. The late overall transition, which is attributed to the low equivalent roughness, minimized the damage caused by the debris impact. CORRECTIVE_ACTION: MSFC has taken the following steps to minimize SRB debris: a. All DFI, ground instrumentation, and heater cable cork will be inspected for voids (or debonding) using a tap technique in the areas that could damage the Orbiter or External Tank. b. All voids detected to be greater than 1.6" x 1.6" x 1/4" will be vented by drilling a .125 inch hole angling forward at 40 degrees from the cork surface. For large voids, holes will be drilled every 1.6 inches. A small amount of HD-2 grease will be applied to each hole as a moisture barrier. Where voids are detected at the cork edges, the cork will be removed and replaced with K5NA material. c. Tests will be conducted to assure that cork will not be blown off due to increasing atmospheric-induced pressure changes and that grease applied to the drilled areas will not produce adverse debris effects. For the STS-29 and subsequent SRM's, the cork bonded to the motor will be tested and repaired if necessary, and all cap cork will be replaced with K5NA. Where cap cork has already been installed, the STS-27 inspection will be repeated. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR**	**IFA** STS-26R-V-14	MPS
None	**GMT:** Postlanding		**SPR** KB0346	**UA**	**Manager:**
			IPR None	**PR**	
					Engineer:

Title: 4-Inch LH2 ET/Orbiter Disconnect Leak. (ORB)

Summary: DISCUSSION: During a post-landing inspection of OV-103 at the Dryden Flight Research Center, an audible leak was found emanating from the 4-inch Orbiter Liquid Hydrogen (LH2) disconnect region. A more detailed inspection at the Kennedy Space Center revealed that the Orbiter flapper seal had a piece broken off approximately 1/2 inch long by 1/16 inch wide. This piece was not found.

A Main Propulsion System (MPS) leak-check performed prior to the STS-26 Flight Readiness Firing (FRF) showed no evidence of leakage in this area. However, a post-FRF check revealed a 206 scim internal leak past the LH2 4-inch Recirculation Disconnect Valve, PD3. This condition was waived for the STS-26 mission (reference waiver WK0782). This leak was probably caused by the flapper seal damage identified post-flight. The mission was not affected by the presence of this condition. CONCLUSION: The leak in the 4-inch Orbiter LH2 disconnect assembly was most probably caused by damage to the flapper seal which occurred when the flapper valve closed as part of the engine shutdown procedure during the STS-26 FRF. Damage to the seal was found to have been caused by a build-up of worst-case flapper/seal tolerance. Vendor reshimmed flapper assembly to improve tolerances. Subsequent leak check was nominal. CORRECTIVE_ACTION: The 4-inch LH2 flapper seal was removed, replaced and returned to the vendor. Engineering Change submitted to tighten tolerances on future 4-inch LH2 disconnect assemblies. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:22:05	Problem	**FIAR** B-FCE-029-F001	**IFA** STS-26R-V-15	OI - Recorders
INCO-03	**GMT:** 274:13:42		**SPR**	**UA**	**Manager:**
			IPR None	**PR**	
					Engineer:

Title: OPS-2 Recorder Modulating While OPS-1 Recorder Dumping. (GFE)

Summary: DISCUSSION: At approximately 274:13:42 G.m.t., while repositioning the OPS-2 recorder via a rewind command, the ground reported that modulation was seen on the FM frequency. Troubleshooting was performed and determined that when repositioning the OPS-2 recorder (wind/rewind) while dumping the OPS-1 recorder, the OPS-2 recorder will output and cause link interference. This problem was avoided by not repositioning the OPS-2 recorder while dumping OPS-1 and there was no mission impact. It was determined that the OPS-2 recorder model 4411900-0005 does not have the capability of inhibiting serial output during repositioning. Postflight tests confirmed this problem. The vendor confirmed that this failure mode exists on the -0005 models S/N's 1019, 1020 and 1021 due to a manufacturing error.

CONCLUSION: The tape recorder was improperly wired. CORRECTIVE_ACTION: Change-out of the recorder on OV-103 will be performed when a replacement recorder is available. The operational workaround will be to prohibit winding/rewinding the -0005 tape recorders when the parallel dump mode is in use. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-26R-V-16	D&C
None	GMT:		SPR 26RF09	UA	Manager:
			IPR None	PR	
					Engineer:

Title: Radar Altimeter Failed Off At Landing. (ORB)

Summary: DISCUSSION: The crew reported that the "off" flag (indicating loss of valid data) appeared on the PLT's Radar Altimeter display at approximately 30 feet altitude and remained "off" after switching to the alternate altimeter. This was also noted on the CDR's display. The data became good again at approximately 5 feet altitude. The crew completed a normal landing using alternate visual cues. Post flight data analysis confirmed that radar altimeters 1 and 2 lost lock at altitudes of 38 and 53 feet, respectively.

The receiver is designed with a dynamic sensitivity capability that permits automatic gain adjustment as a function of altitude and time in order to avoid nosewheel lock-on and to eliminate ground reflections that may bounce off the gear. CONCLUSION: The most probable cause for Radar Altimeter loss-of-lock was incorrect low-altitude receiver gain sensitivity settings. CORRECTIVE_ACTION: The Radar Altimeter units for OV-103 and OV-104 were returned to the vendor to test and readjust the low-altitude receiver gain sensitivity settings. The OV-104 units have been returned to service. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET: Postlanding	Problem	FIAR B-FCE-029-F002	IFA STS-26R-V-17A	GFE
None	GMT: Postlanding		SPR None	UA	Manager:
			IPR None	PR	
					Engineer:

Title: Video Cassette Tapes Jammed In Recorder. (GFE)

Summary: DISCUSSION: During the post-flight crew debriefing, the crew reported that four video cassette tapes had jammed in the video cassette recorder (VCR), and one had to be cut with scissors to effect its removal. The crew noted that the video cassette recorder and cameras are older designs and recommended replacement with more state-of-the-art equipment. Some recorded video was lost due to tapes jamming, but did not affect the mission. The VCR was removed from the vehicle. Inspection showed that the heads were clean and no debris was found in the cabinet.

CONCLUSION: The most likely cause is unwinding of the tape due to zero-g, which has occurred in past flights, or removal of the tape in less than 10 seconds after stopping the tape. CORRECTIVE_ACTION: For STS-27, the crew procedure to be used is to tension the tape by hand before inserting it into the VCR. For subsequent flights, it is recommended that an existing tape tension holder be installed on each tape prior to flight. EFFECTS_ON_SUBSEQUENT_MISSIONS: Possible loss of recorded video.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR** BFCE213F002	**IFA** STS-26R-V-17B	GFE
None	**GMT:**		**SPR** None	**UA**	**Manager:**
			IPR None	**PR**	
					Engineer:

Title: Vacuum Cleaner Flapper Failed Open. (GFE)

Summary: DISCUSSION: During the post-flight crew debriefing, the crew reported that the vacuum cleaner was blowing vacuumed material past the vacuum cleaner flapper, rendering the vacuum cleaner unusable. There was no effect on the flight other than the inability to use the vacuum cleaner to clean the cabin and filters. Post-flight inspection found that the vacuum cleaner flapper lacked about one-quarter of an inch of closing. No vacuum cleaner flappers have been replaced to date.

CONCLUSION: The vacuum cleaner flapper did not close properly. The most probable cause was the age of the rubber flapper. CORRECTIVE_ACTION: Inventory will be checked, and the vacuum cleaner with the best flapper will be flown on STS-27. New flappers have been ordered and if they do not solve the problem, a new flapper design will be considered and a workaround crew procedure will be furnished. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR** JSCEC0382	**IFA** STS-26R-V-17C	CREW
None	**GMT:** Postlanding		**SPR** None	**UA**	**Manager:**
			IPR None	**PR**	
					Engineer:

Title: Seat Backs Failed To Fold With Parachutes Attached. (ORB)

Summary: DISCUSSION: During the post-flight crew debriefing, the crew reported that although seat backs with parachutes attached could be folded in ground tests, they could not be folded in flight. The seats were stowed unfolded in the airlock. There was no effect on the mission.

A functional test of a flight seat was performed with the parachute attached and the seat would fold with the back rest in the entry position. The seat would not fold with the back rest in the launch position. CONCLUSION: The seats would not fold because the back rests were in the launch position when the crew attempted to store them. CORRECTIVE_ACTION: Provide the correct procedure for stowing seats with parachutes attached to crew training personnel for training of subsequent crews. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR** BFCE028F001,	**IFA** STS-26R-V-17D	undefined
None	**GMT:** Postlanding		JSCEP021, HEN092	**UA**	**Manager:**
			SPR None	**PR**	
			IPR None		**Engineer:**

Title: Aft Fuselage Gas Sampler System Failed. (GFE)

Summary: DISCUSSION: Post-flight inspection found that the left aft fuselage gas sample bottles failed to open during the mission. A post-mission voltage test of the left side battery packs showed that they were still good, and should have been dead, as were the right side battery packs (the right side gas bottles opened properly during mission). The gas sampler system is activated by an acoustical level of 132 decibels, which is sensed by a microphone contained in the electronics assembly.

There was no effect on the mission, but post-mission analysis of the contents of the gas bottles was not possible, since these gas bottles failed to open in flight. The left side electronics assembly, cables, and battery box have been removed from the Orbiter and underwent 3-axis vibration and acoustical testing at flight levels (using new battery packs), but the anomaly could not be duplicated. The electronics assembly is being disassembled for further testing. CONCLUSION: The most probable cause of the left aft fuselage gas sampler system failure is an intermittent connection in the electronics assembly. CORRECTIVE_ACTION: The left aft fuselage gas sampler system will be replaced with a spare unit. EFFECTS_ON_SUBSEQUENT_MISSIONS: None, pending test results.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR** None	**IFA** STS-26R-V-17E	CREW
None	**GMT:**		**SPR** None	**UA**	**Manager:**
			IPR None	**PR**	
					Engineer:

Title: One Dosimeter Read High (GFE)

Summary: DISCUSSION: A high reading on one dosimeter was noted during ground turnaround activities. There was no effect upon flight, since the other dosimeters onboard the Orbiter read expected values.

CONCLUSION: The most probable cause of the high dosimeter reading is the age of the dosimeter. This is a common failure mode of old dosimeters. CORRECTIVE_ACTION: The dosimeter will be replaced with an off-the-shelf spare. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR**	**IFA** STS-26R-V-18A	D&C - Lighting
None	**GMT:** Postlanding		**SPR** 26RF15	**UA**	**Manager:**
			IPR None	**PR**	
					Engineer:

Title: Forward Port Floodlight Failed Off. (ORB)

Summary: DISCUSSION: During the post-flight crew debriefing, it was reported that the forward port floodlight had failed off. There was no effect on the mission. The anomaly was duplicated during ground testing.

CONCLUSION: The cause for the forward port floodlight failure is unknown, pending failure analysis. CORRECTIVE_ACTION: The forward port floodlight was removed and replaced. EFFECTS_ON_SUBSEQUENT_MISSIONS: None

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Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR**	**IFA** STS-26R-V-18B	D&C - Lighting
None	**GMT:** Postlanding		**SPR** None	**UA**	**Manager:**
			IPR None	**PR**	
					Engineer:

Title: Forward Bulkhead Floodlight Failed "Flickering" (ORB)

Summary: DISCUSSION: During the post-flight crew debriefing, it was reported that the forward bulkhead floodlight was flickering during operation. Further discussion with the crew found that the lights were turned on for payload bay door closing activity, and the floodlight flickered continuously without ever achieving full brightness. There was no effect on the mission. Ground testing duplicated flickering; the floodlight started flickering after 15 seconds from turn-on and achieved full brightness in less than 5 minutes.

CONCLUSION: Flickering of floodlights is expected and normal for up to 15 minutes following activation if the floodlight has been used previously, and up to 5 minutes following a cold start. In-flight turn on characteristics could not be duplicated on the ground. All ground testing produced a stabilized light level in less than the specification time of 5 minutes. As this floodlight is non-critical to any payload bay operations, the floodlight will remain in the vehicle to obtain additional data on a future mission. CORRECTIVE_ACTION: None. EFFECTS_ON_SUBSEQUENT_MISSIONS: None

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:00:13	Problem	**FIAR**	**IFA** STS-26R-V-19	HYD
None	**GMT:** 273:15:50		**SPR** 26RF12	**UA**	**Manager:**
			IPR None	**PR**	
					Engineer:

Title: Water Spray Boiler 1 GN2 Tank Leak. (ORB)

Summary: DISCUSSION: Water spray boiler 1 gaseous nitrogen (GN2) tank leakage was observed after nitrogen (N2) isolation valve closure following auxiliary power unit (APU) shutdown at 273:15:50:34 G.m.t. The tank pressure exhibited a steady decay rate of approximately 0.85 psia/hour until the APU was started prior to the deorbit burn. This occurrence exceeded specifications but had no impact on the mission.

CONCLUSION: Water spray boiler 1 experienced a GN2 leak at a hardware component upstream of the N2 isolation valve. CORRECTIVE_ACTION: After being recharged with GN2 at KSC per normal turnaround operations, the tank pressure was leak checked for three weeks. No abnormal leakage was observed. The system will not be replaced and is go to fly as is. EFFECTS_ON_SUBSEQUENT_MISSIONS: None

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 002:21:49	Problem	**FIAR**	**IFA** STS-26R-V-20	D&C - Panels
None	**GMT:** 276:13:26		**SPR** 26RF22	**UA**	**Manager:**
			IPR None	**PR**	
					Engineer:

Title: Dedicated Display Checkout Discrepancies. (ORB)

Summary: DISCUSSION: During the OPS 8 Dedicated Display checkout, at approximately 276:13:26 G.m.t., the crew reported the following discrepancies on the left hand (CDR) instruments for the "LOW" test:

INSTRUMENT ACTUAL EXPECTED ADI Roll Error 1.5 ticks L 2.0 ticks L (+/-.25) ADI Yaw Error 1.5 ticks L 2.0 ticks L (+/-.25) ADI Pitch Error 1.0 tick D 2.0 ticks D (+/-.25) AMI Mach/Vel 20250 20000 (+/-100) AVVI Alt Rate -185 -200 (+/-3) AVVI Alt +180 +200 (+/-16.7) During this test, the GPC sends a pre-defined set of test values to both the left and right DDU's which drive the appropriate instruments. Attitude error signals are transmitted in analog form from the DDU to the ADI error needle drives. The DDU's transmit Mach/Velocity, Altitude, and Altitude Rate via 1 MHz serial Manchester code to the AMI and AVVI Electronic Assemblies, where it is converted to analog servo drive signals for positioning of the respective tape meters. An inflight comparison between the ADI and DAP errors while in OPS 201, showed the error

needles to be functioning properly. A review of flight downlist data indicated proper output from the GPC. Postflight troubleshooting failed to reproduce the problem using either OPS 8 software or a similar OPS 9 test. CONCLUSION: The discrepancy occurred only in OPS 8 on-orbit checkout and was not evident during subsequent ground checkout. There was no evidence of any discrepancies during any of the in-flight operational modes. CORRECTIVE_ACTION: None. EFFECTS_ON_SUBSEQUENT_MISSIONS: None